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6-8 EPPING ROAD, EPPING

Acoustic Assessment for Development Application

5 June 2014

Novati Constructions Pty Ltd

TG804-01F02 (r1) Acoustic Report for DA

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1 Introduction

This report presents an assessment of noise intrusion into, and operational noise from the proposed residential development at 6-8 Epping Road, Epping.

This study examines the effects of external noise intrusion onto the proposed development from nearby ambient noise sources. Noise surveys have been conducted by Renzo Tonin & Associates between Friday 2nd May and Wednesday 7th May 2014 at the development site to determine the existing levels of ambient noise at the site. These levels were used to predict noise levels within the property, and then assessed against the recommended internal noise criteria for the project.

As a result of our assessment of the following potential acoustic items were identified;

- Existing and future traffic noise from Epping Road intruding into the development;
- Distant airborne traffic noise from Blaxland Road;
- Distant airborne rail noise from the Northern Rail Line;
- Noise intrusion from the use of the site to the south from RailCorp activities;
- Mechanical services noise emission from the proposed residential buildings; and
- Noise and vibration emission from construction activities and equipment.

This report presents an assessment of the above acoustic components in terms of Council's Development Control Plans, State Environmental Planning Policy (Infrastructure) 2007 and Australian Standards.

The measured traffic noise levels at the building facades were used to determine the sound insulation rating requirements for the external building elements in accordance with the acoustic criteria nominated for this development.

In regard to acoustic privacy, this is generally satisfied through the requirements of the Building Code of Australia which all new residential development would need to comply.

Further detailed discussion of the identified acoustic factors is set out within this report.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Site and surrounds

The proposed development at 6-8 Epping Road, Epping is to consist a multi-storey residential building consisting of 2 levels of basement car parking, 8 levels of apartments and a ground floor combining car parking and apartments. The development consists of a total of 75 apartments and access to the development is via Epping Road.

The site location is predominantly surrounded by residential homes and apartment complexes. The Northern Rail Line is located approximately 75m to the west of the site, and Blaxland Road is located approximately 50m west of the development site.

The land to the south of the development site is currently being utilised by Railcorp for the storage of vehicles and equipment. The details as to the term of the use of this site are unclear at this time and as a result, noise generated by the site has been included in our assessments of noise intrusion into the proposed development site.

Long term noise monitoring has been undertaken at the site to determine the existing acoustic environment.

Figure 1: Site Location and Surrounds

3 Internal noise criteria

A number of documents were taken into consideration when determining suitable criteria for the proposed development site. These included:

- State Environment Planning Policy (Infrastructure) 2007 [**"ISEPP"**]
- Department of Planning publication "Development Near Rail Corridors & Busy Roads – Interim Guideline" 2008 [**"ISEPP Guideline"**]
- Hornsby Shire Council Development Control Plan 2013

Epping Road is identified as a road requiring a mandatory assessment (greater than AADT 40,000) on The Roads and Maritime Services (RMS) Traffic Volume Maps for ISEPP.

Rail noise and vibration have not been assessed as the site lies well outside zones identified in Figure 3.1 and Figure 3.2 of the ISEPP Guideline.

As a result, the acoustic criteria as determined in The ISEPP Clause 102 and The Department of Planning's Guideline are considered the most appropriate criteria for this development site and is summarised in the table below.

Table 1 summarises the recommended design sound levels for building interiors in the proposed development.

Table 1: Recommended design sound levels for building interiors

Occupancy	Windows & Doors Condition	Design Noise Level	
		Day, $L_{Aeq\ (15hour)}$	Night, $L_{Aeq\ (9hour)}$
Sleeping areas	Closed	-	35 dB(A)
Living Areas	Closed	40 dB(A)	40 dB(A)
Apartment common areas	Closed	55 dB(A)	55 dB(A)

APPENDIX C presents results of the unattended ambient noise survey conducted on site.

4 Measured and predicted noise levels

4.1 Long-term noise survey

Two RTA Technology Environmental Noise Loggers were set up for the ambient noise survey from Friday 16th May to Friday 23rd May 2014. One logger was positioned at the Epping Road boundary fence of the existing residential home at 8 Epping Road. The logger was set back at a distance of approximately 3.5m from the kerb of Epping Road. A second logger was positioned at the rear of the site at 8 Epping Road, Epping approximately 3m from the rear boundary of the site. (Refer to Appendix C for more detail).

The noise logger records noise levels on a continuous basis and stores data every fifteen minutes. The noise loggers were calibrated before and after measurements and no significant deviation in calibration was noted. The noise monitoring equipment used here complies with Australian Standard 1259.2-1990 "Acoustics - Sound Level Meters" and is designated as Type 2 instruments suitable for field use.

The dates of measurement and the results obtained from the logger survey are shown in APPENDIX C.

Section 5 of this report recommends acoustic performance requirements for the glazed facades of the development.

4.2 Short-term noise measurements

Short-term attended measurements were taken at the corner of Epping Road and Blaxland Road, Epping. The acquired noise levels were correlated with the results of the long-term monitoring and used to predict traffic noise levels at the facades of the development.

The design external traffic noise levels are presented below.

Table 2: Predicted external noise levels

Facade	Time Period	Design Noise Level LAeq,T
North (Epping Road)	Day time (7am to 10pm)	67 dB(A)
	Night time (10pm to 7am)	62 dB(A)
West (facing Blaxland Rd and Northern Rail Line)	Day time (7am to 10pm)	64 dB(A)
	Night time (10pm to 7am)	59 dB(A)
South	Day time (7am to 10pm)	62 dB(A)
	Night time (10pm to 7am)	53 dB(A)

Note: 1. at 1m from façade, centrally positioned along the façade width

Results from the noise surveys were used to calculate internal noise levels within the proposed development. Noise calculations were performed using glazing design software developed in this office which take into account external noise levels, facade transmission loss and room sound absorption characteristics.

4.3 RailCorp activities at site to the south

The time frame for the use of the site to the south of the development site at 6-8 Epping Rd currently used by RailCorp is unknown. As a result, the impacts of the site on the proposed development have been assessed.

Noise generated by the use of the site to the south of the development, including movements in and out of the site and site activities have been measured during both the long-term noise survey and short-term measurements and have been taken into consideration when determining suitable facade constructions for the proposed development site.

Section 5 of this report recommends acoustic performance requirements for the glazed facades of the development.

5 Control of External noise – window glazing

5.1 Glazing

To achieve the criteria outlined in Table 1 with windows closed, the following table presents the recommended glazing acoustic performances for the proposed development.

Table 2: Recommended acoustic performance of glazing assembly

Facade	Level(s)	Occupancy	Required Acoustic Rating of Glazing Assembly, Rw
		Building 1	
Northern Facade – facing Epping Road	All Levels	Living/ dining	Rw 35
		Bedroom	Rw 35
Eastern Facade (north of lift lobby)	All levels	Living	Rw 35
		Bedroom	Rw 35
Eastern Facade (south of lift lobby)	All Levels	Living	Rw 32
		Bedroom	Rw 32
Southern facade	All Levels	Living	Rw 28
		Bedroom	Rw 28
Western Facade (north of lift lobby)	All levels	Living	Rw 35
		Bedroom	Rw 35
West – South of Lift Shaft	All levels	Living	Rw 32
		Bedroom	Rw 32

1. Notes:
2. The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.
3. The information in this table is provided for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.
4. The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.
5. Before committing to any form of construction or committing to any builder, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the form of construction where only an "estimate" is available for the sound insulation properties of recommended materials.
6. The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site.
7. All openable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the Rw rating performance of the glazing to not be reduced.
8. The above glazing thicknesses should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading etc.

5.2 Mechanical ventilation

In accordance with the Department of Planning's publication "Development Near Rail Corridors & Busy Roads – Interim Guideline" 2008, it states;

If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

It has long been industry standard to assume a 10dB loss of noise from external to internal through an opened window in a building facade. It is based on the average results of a number of test cases, experimental data and published papers. This assumption has been well documented in The Roads and Traffic Authority (RTA) publications, including the RTA's Environmental Noise Management Manual (ENMM), Table 4.2.

Recent studies on noise reduction through facades with open windows[1] have shown that noise transmission through an open window can vary greatly based on the construction of the facades and noise flanking paths, including exposed floors and roof constructions.

The study indicates that noise loss through an open window of a development consisting of masonry construction with no exposed flooring and a concrete roof will be in the range of 11-15dB.

The table below presents design noise levels at the facades of the buildings and predicted internal noise levels with windows opened and presents a comparison against the "windows opened" criteria as state above.

Table 3: Noise assessment to windows open criteria

Facade	Period	Predicted LAeq,T Traffic Noise Level in dBA		Determined Criteria + 10 dB with Windows Open , LAeq,T	Compliance (Yes/No)
		1m from facade	Inside Apartment with Windows Open, LAeq,T		
North	Day (15-hour)	67	52-56 dB(A)	50 dB(A)	No
	Night (9-hour)	62	47-51 dB(A)	45 dB(A)	No
South	Day (15-hour)	62	47-51 dB(A)	50 dB(A)	Yes
	Night (9-hour)	53	38-42 dB(A)	45 dB(A)	Yes
East (south of lift shaft)	Day (15-hour)	64	49-53 dB(A)	50 dB(A)	Yes*
	Night (9-hour)	59	41-45 dB(A)	45 dB(A)	Yes
West (south of lift shaft)	Day (15-hour)	64	49-53 dB(A)	50 dB(A)	Yes*
	Night (9-hour)	59	41-45 dB(A)	45 dB(A)	Yes

Notes: * Further assessment required at detailed design to consider facade design, opening sizes, room volumes and finishes

The predicted internal traffic noise levels with windows opened when assessed against the nominated criteria cannot be achieved for units located on Epping Road facade. Therefore, an alternative form of ventilation is to be considered to meet the ventilation requirements of the Building Code of Australia.

[1] Ryan, Lanchester and Pugh, 2011

Internal noise levels with windows opened can be achieved within apartments on the south, east and western facades of the apartment building and do not require an alternative ventilation design.

6 External noise emission from building services

6.1 EPA requirements

The NSW Environmental Protection Authority (EPA) sets out noise criteria in its Industrial Noise Policy (INP) to control the noise emission from industrial sources such as mechanical plant. The applicable noise limits, according to the policy, are determined as follows:

Table 4: L_{Aeq} design criteria for noise emission from mechanical plant (EPA INP)

Time of Day	Column 1	Column 2	Column 3	Column 4
	Rating Background Level (RBL) L90	**Instrusiveness Criterion (RBL+5)**	**Amenity Criterion (Acceptable)**	**Project Specific Design Criterion LAeq, T**
Day (7am to 6pm)	45 dB(A)	50 dB(A)	60 dB(A)	**50 dB(A)**
Evening (6pm to 10pm)	44 dB(A)	49 dB(A)	50 dB(A)	**49 dB(A)**
Night (10pm to 7am)	38 dB(A)	43 dB(A)	45 dB(A)	**43 dB(A)**

Explanatory notes:

Column 3 – Recommended LAeq noise level based on 'Residence –Urban' area in Section 2.2, Table 2.1 Amenity Criteria (Recommended LAeq noise levels from industrial noise sources) of the EPA's INP.

Column 4 – Project Specific Design Criterion based on EPA's INP. Lower of Columns 2 and 3.

Where necessary, noise amelioration treatment will be incorporated in the design to ensure that noise levels comply with the recommended EPA's INP noise emission criteria noted above.

Although at this stage details of mechanical plant have not been finalised, the following in-principle advice is provided.

- Acoustic assessment of mechanical services equipment will need to be undertaken during the detail design phase of the development to ensure that they shall not either singularly or in total emit noise levels which exceed the noise limits in EPA's Industrial Noise Policy or Council's requirements;
- As noise control treatment can affect the performance of the mechanical services system, it is recommend that consultation with an acoustic consultant be made during the initial phase of mechanical services system design in order to reduce the need for revision of mechanical plant and noise control treatment;
- Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following:
- procurement of 'quiet' plant,

- strategic positioning of plant away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises,
- commercially available silencers or acoustic attenuators for air discharge and air intakes of plant;
- acoustically lined and lagged ductwork;
- acoustic screens and barriers between plant and sensitive neighbouring premises; and/or
- Partially-enclosed or fully-enclosed acoustic enclosures over plant.
- Mechanical plant shall have their noise specifications and their proposed locations checked prior to their installation on site; and
- Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 "Rotating and Reciprocating Machinery – Mechanical Vibration".

7 Internal sound insulation

As a minimum requirement, walls and floors and separation of services shall comply with the Building Code of Australia 2014 (BCA).

7.1 BCA 2014 requirements

The acoustic provisions for inter-tenancy walls in Class 2 and 3 buildings are outlined in the Building Code of Australia and the following is an extract from the BCA:

F5.2 Determination of airborne sound insulation ratings

A form of construction required to have an airborne sound insulation rating must –

a. have the required value for weighted sound reduction index (Rw) or weighted sound reduction index with spectrum adaptation term (Rw + Ctr) determined in accordance with AS/NZS 1276.1 or ISO 717.1 using results from laboratory measurements; or

b. comply with Specification F5.2.

F5.3 Determination of impact sound insulation ratings

a. A floor in a building required to have an impact sound insulation rating must –

i. have the required value for weighted normalised impact sound pressure level with spectrum adaptation term (Ln,w+CI) determined in accordance with AS/ISO 717.2 using results from laboratory measurements; or

ii. comply with Specification F5.2.

b. A wall in a building required to have an impact sound insulation rating must –

i. for a Class 2 or 3 building be of discontinuous construction;

c. For the purposes of this part, discontinuous construction means a wall having a minimum 20 mm cavity between 2 separate leaves, and

i. for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and

ii. for other than masonry, there is no mechanical linkage between leaves except at the periphery.

F5.4 Sound insulation rating of floors

a. A floor in a Class 2 or 3 building must have an Rw + Ctr (airborne) not less than 50 and an Ln,w+CI (impact) not more than 62 if it separates –

iii. sole-occupancy units; or

iv. *a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.*

F5.5 Sound insulation rating of walls

a. *A wall in a Class 2 or 3 building must –*

i. *have an Rw + Ctr (airborne) not less than 50, if it separates sole-occupancy units; and*

ii. *have an Rw (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and*

iii. *comply with F5.3(b) if it separates:*

A. a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or

B. A ole-occupancy unit from a plant room or lift shaft

b. *A door may be incorporated in a wall in a Class 2 or 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an Rw not less than 30.*

c. *Where a wall required to have sound insulation has a floor above, the wall must continue to –*

i. *the underside of the floor above; or*

ii. *a ceiling that provides the sound insulation required for the wall.*

d. *Where a wall required to have sound insulation has a roof above, the wall must continue to –*

iii. *the underside of the roof above; or*

iv. *a ceiling that provides the sound insulation required for the wall.*

F5.6 Sound insulation rating of services

a. *If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an Rw+Ctr (airborne) not less than –*

i. *40 if the adjacent room is a habitable room (other than a kitchen); or*

ii. *25 if the adjacent room is a kitchen or non-habitable room.*

b. *If a storm water pipe passes through a sole-occupancy unit it must be separated in accordance with (a).*

8 Construction noise

8.1 Environmental protection authority's construction noise guidelines

The Environmental Protection Authority (EPA) released its Interim Construction Noise Guideline (ICNG) in 2009. This document is being referred to as EPA's standard policy for assessing construction noise on new projects.

The key components of the ICNG that can be incorporated into this assessment include:

1. Use of LAeq as the descriptor for measuring and assessing construction noise.

In recent years NSW noise policies including EPA's NSW Industrial Noise Policy (INP) and the NSW Environmental Criteria for Road Traffic Noise (ECRTN) have moved to the primary use of LAeq over any other descriptor. As an energy average, LAeq provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the LA10 descriptor.

Consistent with the latest guideline (ICNG) the use of LAeq as the key descriptor for measuring and assessing construction noise may follow a 'best practice' approach.

2. Application of feasible and reasonable noise mitigation measures

As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice, and is practical to build given the project constraints.

Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects, including the cost of the measure.

3. Quantitative and qualitative assessment

The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment.

A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria.

A qualitative assessment is recommended for small projects with a short-term duration where works are not likely to affect an individual or sensitive land use for more than three weeks in total. It focuses on minimising noise disturbance through the implementation of feasible and reasonable work practices, and community notification.

Given the significant scale of the construction works proposed for this Project, a quantitative assessment is carried out herein, consistent with the ICNG's requirements.

4. Management Levels

Residences

Table 5 below (reproduced from Table 2 of the ICNG) sets out the noise management levels and how they are to be applied. The guideline intends to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

The rating background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours).

Table 5: Noise at residences using quantitative assessment

Time of Day	Management Level LAeq (15 min)*	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Sensitive Land Use

Table 6 below (reproduced from Table 2 of the ICNG) sets out the noise management levels for various sensitive land use developments.

Table 6: Noise at other sensitive land uses using quantitative assessment

Land use	Management level, LAeq (15 min) – applies when land use is being utilised
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas	External noise level 65 dB(A)
Passive recreation areas	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the 'maximum' internal levels in AS2107 for specific uses.

9 Conclusion

Renzo Tonin & Associates have completed an acoustic assessment of the potential noise impacts to and from the proposed residential development at 6-8 Epping Road, Epping.

The primary assessment related to road traffic noise on the proposed residential building. The study of external noise intrusion into the subject development has found that appropriate controls can be incorporated such as acoustic glazing into the building design to achieve compliance with acoustic requirements of SEPP (Infrastructure) 2007 and Hornsby Council's DCP.

In addition, an assessment of any noise from mechanical plant equipment servicing the buildings shall be undertaken during the detailed design and equipment selection stages to ensure that plant and equipment is designed in accordance with the relevant acoustic criteria.

APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment Period	The period in a day over which assessments are made.
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dBThe sound of a rock band 115dBLimit of sound permitted in industry 120dBDeafening
dB(A)	A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound Absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Criteria and design methodology

B.1 State Environment Planning Policy (ISEPP)

The State Environment Planning Policy – Infrastructure 2007, Clause 102 states:

102 Impact of road noise or vibration on non-road development

(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) a building for residential use,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or child care centre.

(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.

(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the building—35 dB(A) at any time between 10 pm and 7am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

(4) In this clause, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.

B.2 Department of Planning – Development near Rail Corridors and Busy Roads

The Guideline provides direction for developments that may be impacted by rail corridors and/or busy roads and consideration for the Guideline is a requirement for development specified under the Infrastructure SEPP.

The Guideline recommends an acoustic traffic assessment be undertaken for roads having an AADT of greater than 20,000 and less than 40,000 vehicles per day and states an assessment is mandatory for roads having an AADT of greater than 40,000 vehicles per day.

Table 3.1 of the Guideline summaries noise criteria for noise sensitive developments

Residential Buildings		
Type of occupancy	**Noise Level dBA**	**Applicable time period**
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways	40	At any time
Non–Residential Buildings		
Type of occupancy		**Recommended Max Level dBA**
Educational Institutions including child care centres		40
Places of Worship		40
Hospitals	- wards	35
	-other noise sensitive areas	35

Note: airborne noise is calculated as Leq (9h) (night) and Leq (15h)(day). Ground-borne noise is calculated as Lmax (slow) for 95% of rail pass-by events.

B.3 Hornsby Development Control Plan 2013 – Part 3 Residential

Section 3.5.14 of the Hornsby Development Control Plan 2013 provides Key Development Principles for 6+ Storey Residential Flat Buildings, including the following:

Development adjoining railway lines and arterial roads should incorporate appropriate measures to reduce the impact of road/rail noise, vibration and disturbance.

APPENDIX C Location and results of the noise surveys

Figure 1 – Noise Monitoring Locations

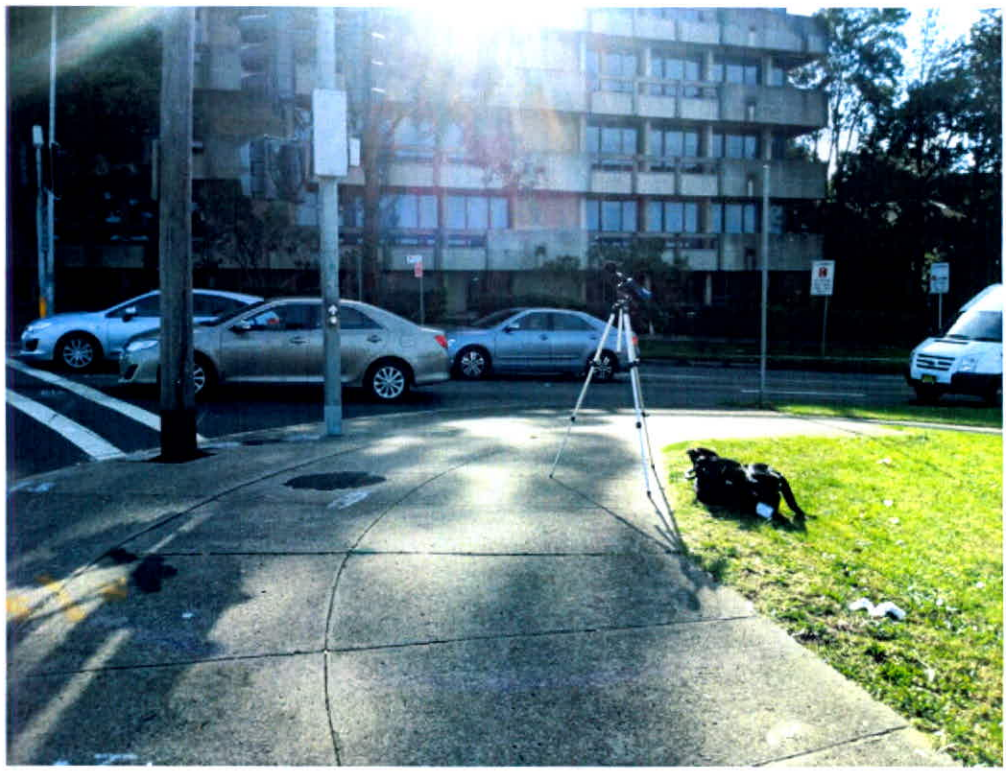
- Long term monitoring location
- Short term monitoring locations

C.1 Long-term monitoring details

Noise Logger Location	Survey Period, T
Location 1 - Approximately 7m set back from Epping Road kerb	Friday 16th May to Friday 23rd May 2014
Location 2 – Approximately 49m set back from Epping Road kerb	

C.2 Short-term attended monitoring details and results

Assessment Location	Survey Period, T (hh:mm)	Measured $L_{Aeq,(T)}$
Location 1 – Positioned on the corner of Epping Road and Blaxland Road, approximately 4m from the kerb corner.	Friday 23 May 2014 10:53 – 11:08	72.3 dB(A)



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8 Epping Road, Epping - rear of site

Background & Ambient Noise Monitoring Results - NSW 'Industrial Noise Policy', 2000

	L_{A90} Background Noise Levels[5]			L_{Aeq} Ambient Noise Levels		
Date	Day	Evening	Night	Day	Evening	Night
Friday-16-May-2014	-	44.6	40.6	-	51.6	50.4
Saturday-17-May-2014	45.1	44.0	38.8	52.2	49.4	49.1
Sunday-18-May-2014	45.2	43.2	37.4	51.4	49.7	49.9
Monday-19-May-2014	45.5	44.1	38.0	53.1	50.6	50.7
Tuesday-20-May-2014	45.3	44.1	37.7	53.6	50.4	51.3
Wednesday-21-May-2014	46.2	44.2	36.6	68.6	51.4	49.9
Thursday-22-May-2014	46.0	47.0	38.2	54.9	52.2	50.6
Friday-23-May-2014	-	-	-	-	-	-
Representative Weekday	**45.8**	**44.2**	**38.0**	**63.0**	**51.3**	**50.6**
Representative Weekend	**45.1**	**43.6**	**38.1**	**51.8**	**49.6**	**49.5**
Representative Week	**45.4**	**44.1**	**38.0**	**61.4**	**50.9**	**50.3**

Road / Rail Noise Monitoring Results (at one metre from façade)

	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Date	Day	Night	Day - Up	Day - Low	Night - Up	Night - Low
Friday-16-May-2014	54.7	52.9	56.0	52.1	57.3	47.2
Saturday-17-May-2014	54.1	51.6	58.1	51.2	54.8	45.6
Sunday-18-May-2014	53.8	52.4	56.1	51.6	56.8	47.0
Monday-19-May-2014	55.1	53.2	57.4	52.3	56.2	48.5
Tuesday-20-May-2014	55.5	53.8	58.5	51.8	58.4	45.2
Wednesday-21-May-2014	69.7	52.4	78.3	52.9	55.9	44.1
Thursday-22-May-2014	56.8	53.1	60.3	53.4	56.7	47.1
Friday-23-May-2014	57.6	-	60.6	54.8	-	-
Representative Weekday	**62.8**	**53.1**	**70.8**	**53.0**	**57.0**	**46.7**
Representative Weekend	**54.0**	**52.0**	**57.2**	**51.4**	**55.9**	**46.4**
Representative Week	**61.7**	**52.8**	**69.6**	**52.7**	**56.7**	**46.6**

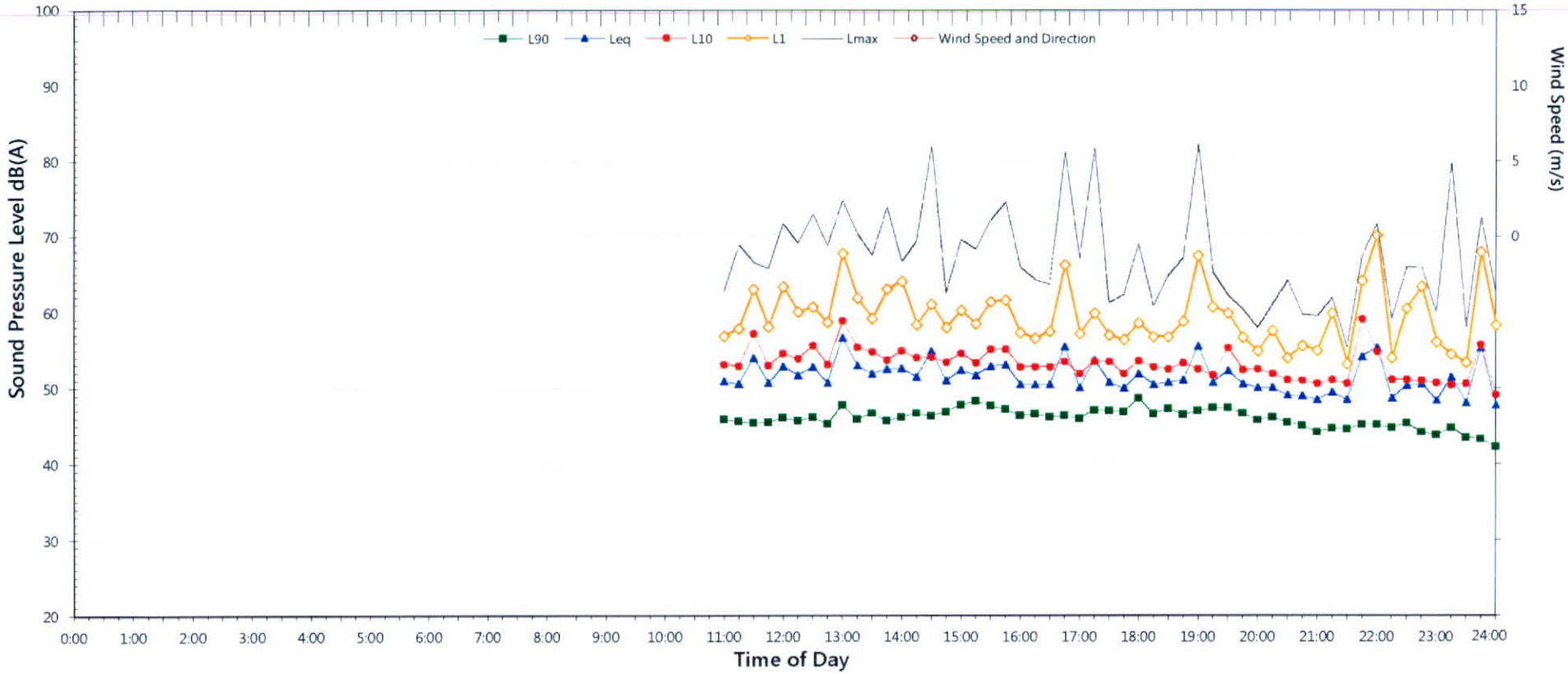
Notes

1. Day is taken to be 7:00am to 6:00pm
2. Evening is taken to be 6:00pm to 10:00pm.
3. Night is taken to be the remaining periods.
4. Rating Background Level (RBL) for L90 and logarithmic average for Leq
5. Assessment Background Level (ABL)
6. Rating Background Level (RBL) for L90 and logarithmic average for Leq

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Friday, 16 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	-	44.6	40.6
Leq	-	51.6	50.4

NOTES

1 Shaded periods denote measurements adversely affected by rain, wind or extraneous noise data in these periods are excluded from calculations

2 "Night" relates to period from 10pm on this graph to 7am on the following graph

3 Graphed data measured in free field, tabulated results facade corrected

4 Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax Leq ≥15dB(A)

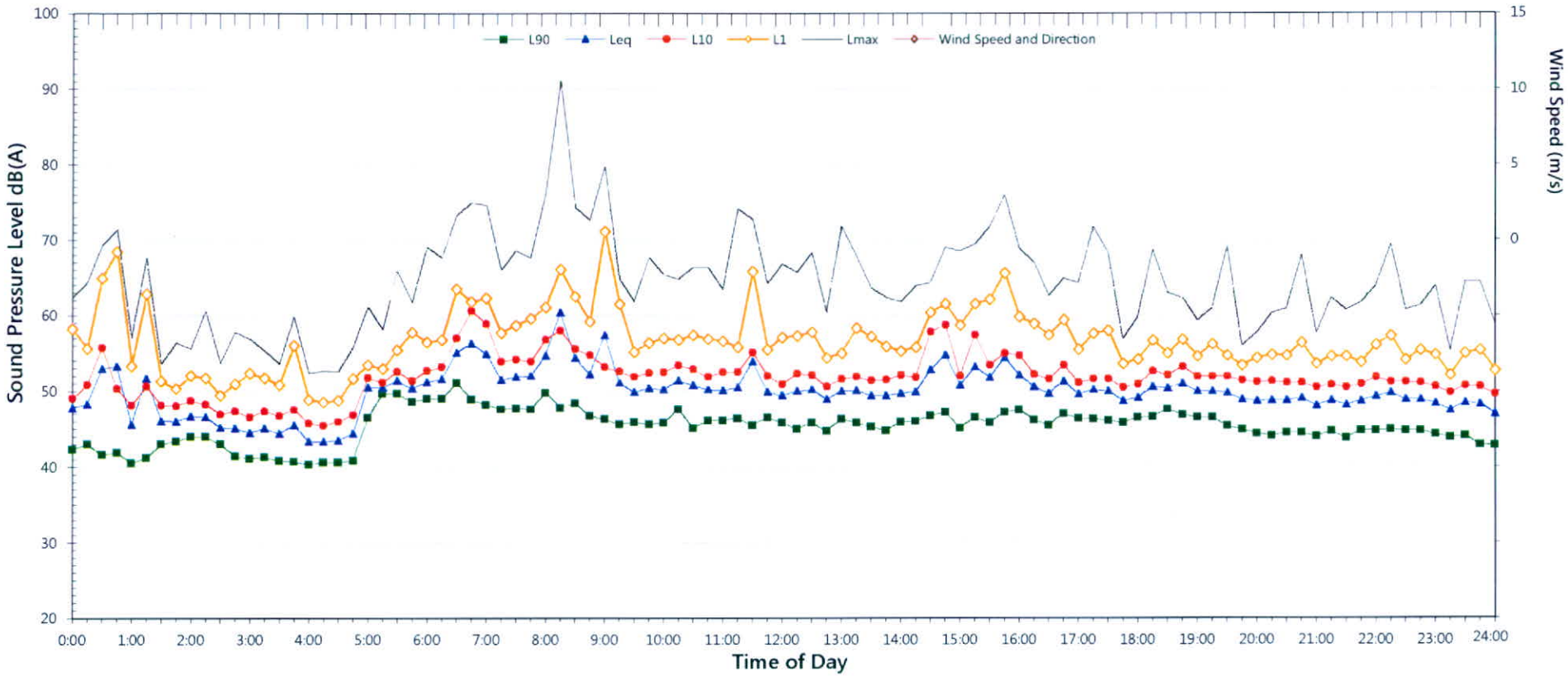
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	54.7	52.9
$L_{eq\ 1hr}$ upper 10 percentile	56.0	57.3
$L_{eq\ 1hr}$ lower 10 percentile	52.1	47.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	66.0	to	79.7
Lmax - Leq (Range)	15.1	to	27.8

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Saturday, 17 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	45.1	44.0	38.8
Leq	52.2	49.4	49.1

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured in free field, tabulated results facade corrected.

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

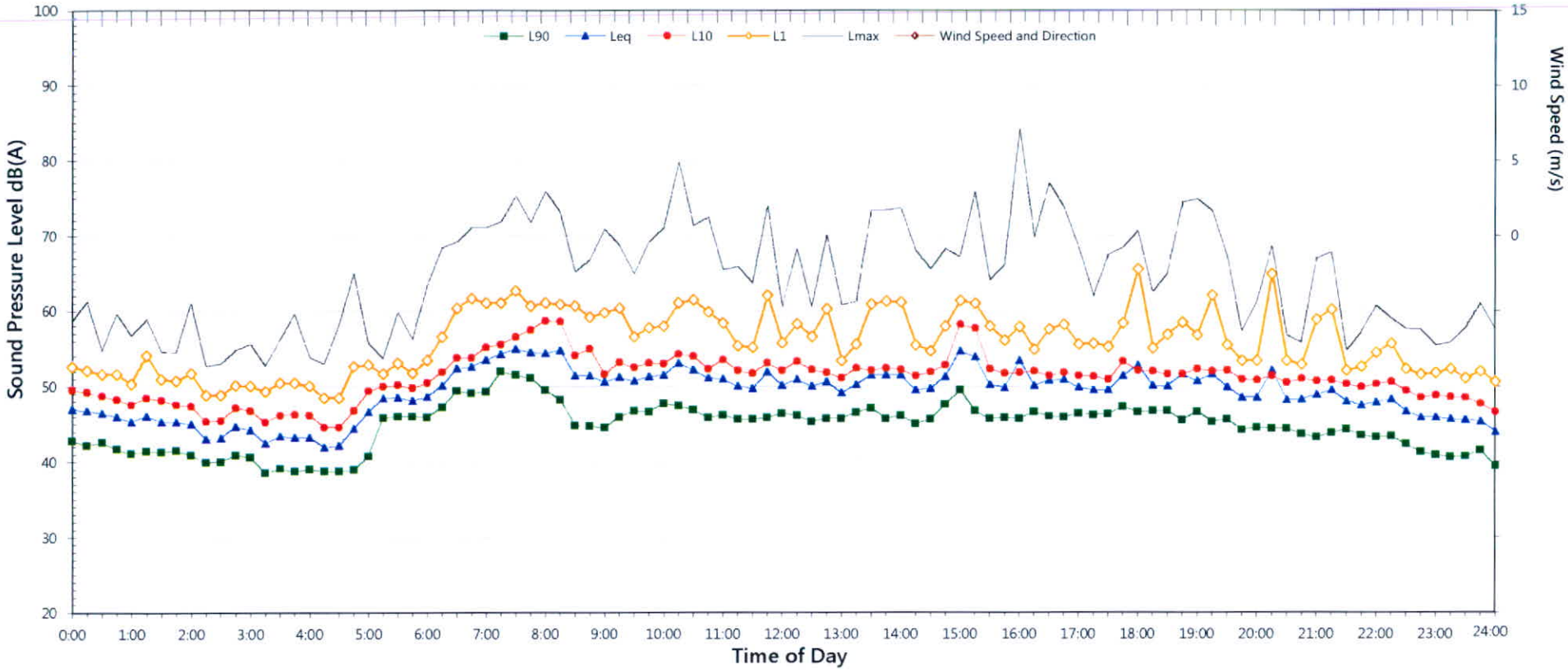
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	54.1	51.6
$L_{eq\ 1hr}$ upper 10 percentile	58.1	54.8
$L_{eq\ 1hr}$ lower 10 percentile	51.2	45.6

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.0	to	71.1
Lmax - Leq (Range)	15.1	to	20.8

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Sunday, 18 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	45.2	43.2	37.4
Leq	51.4	49.7	49.9

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations
2. "Night" relates to period from 10pm on this graph to 7am on the following graph
3. Graphed data measured in free field, tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

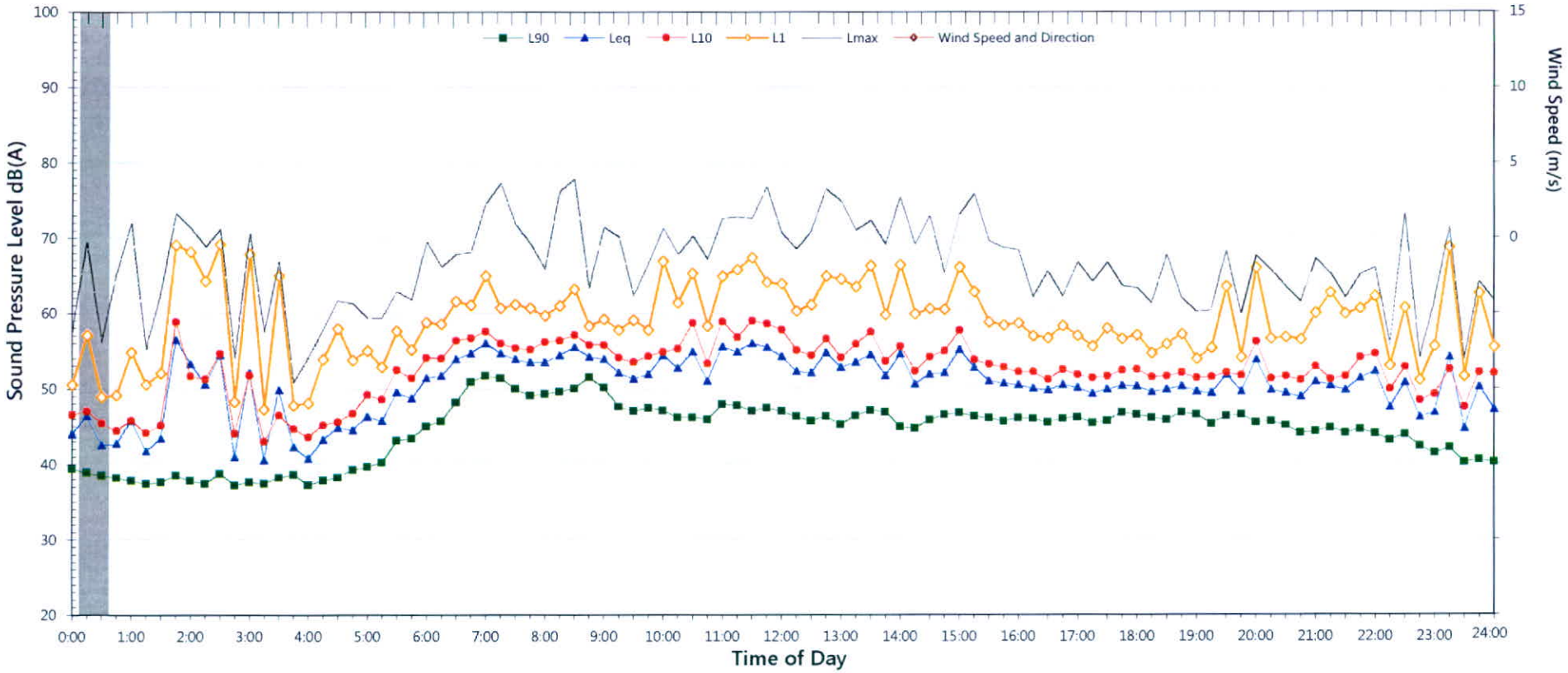
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	53.8	52.4
$L_{eq\ 1hr}$ upper 10 percentile	56.1	56.8
$L_{eq\ 1hr}$ lower 10 percentile	51.6	47.0

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	66.8	to	74.6
Lmax - Leq (Range)	15.8	to	27.5

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Monday, 19 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	45.5	44.1	38.0
Leq	53.1	50.6	50.7

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free field; tabulated results facade corrected.
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

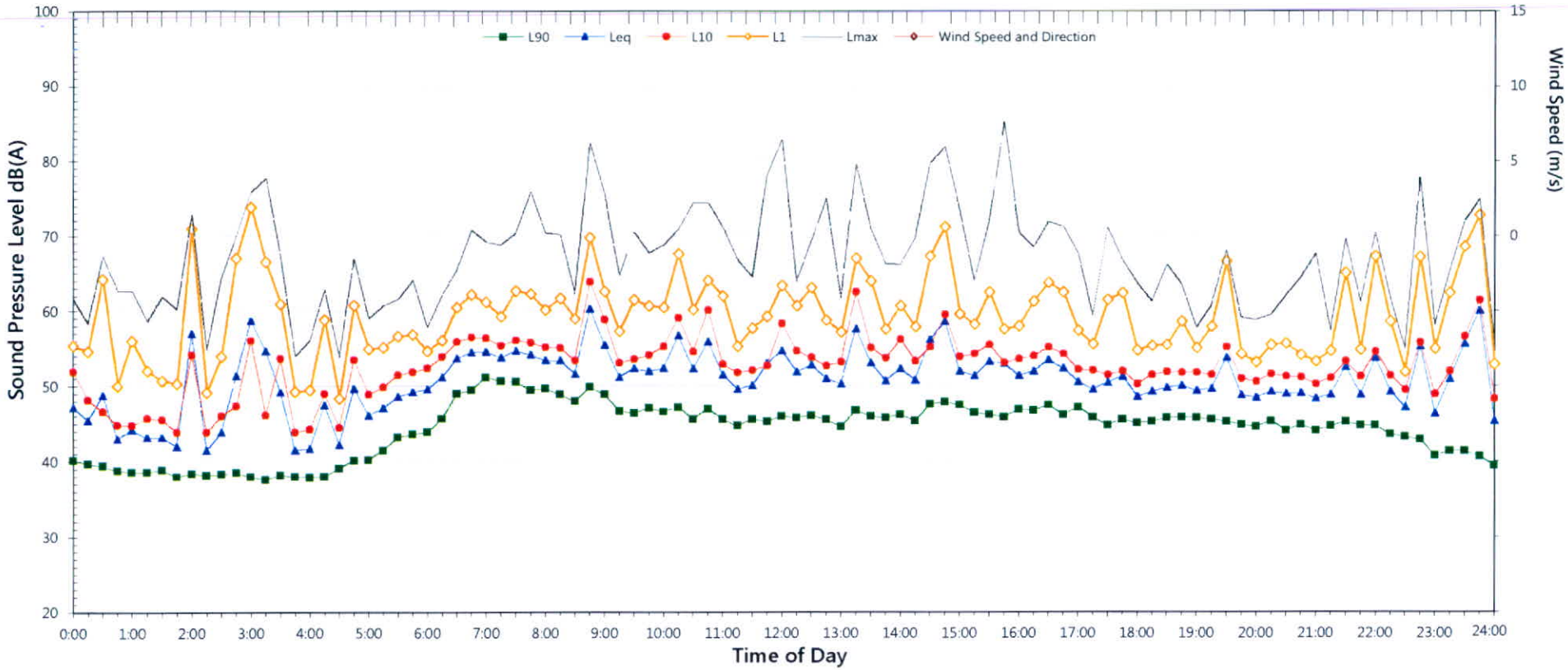
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	55.1	53.2
$L_{eq\ 1hr}$ upper 10 percentile	57.4	56.2
$L_{eq\ 1hr}$ lower 10 percentile	52.3	48.5

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	67.0	to	77.7
Lmax - Leq (Range)	15.4	to	27.6

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Tuesday, 20 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	45.3	44.1	37.7
Leq	53.6	50.4	51.3

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations

2. "Night" relates to period from 10pm on this graph to 7am on the following graph

3. Graphed data measured in free field, tabulated results facade corrected

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

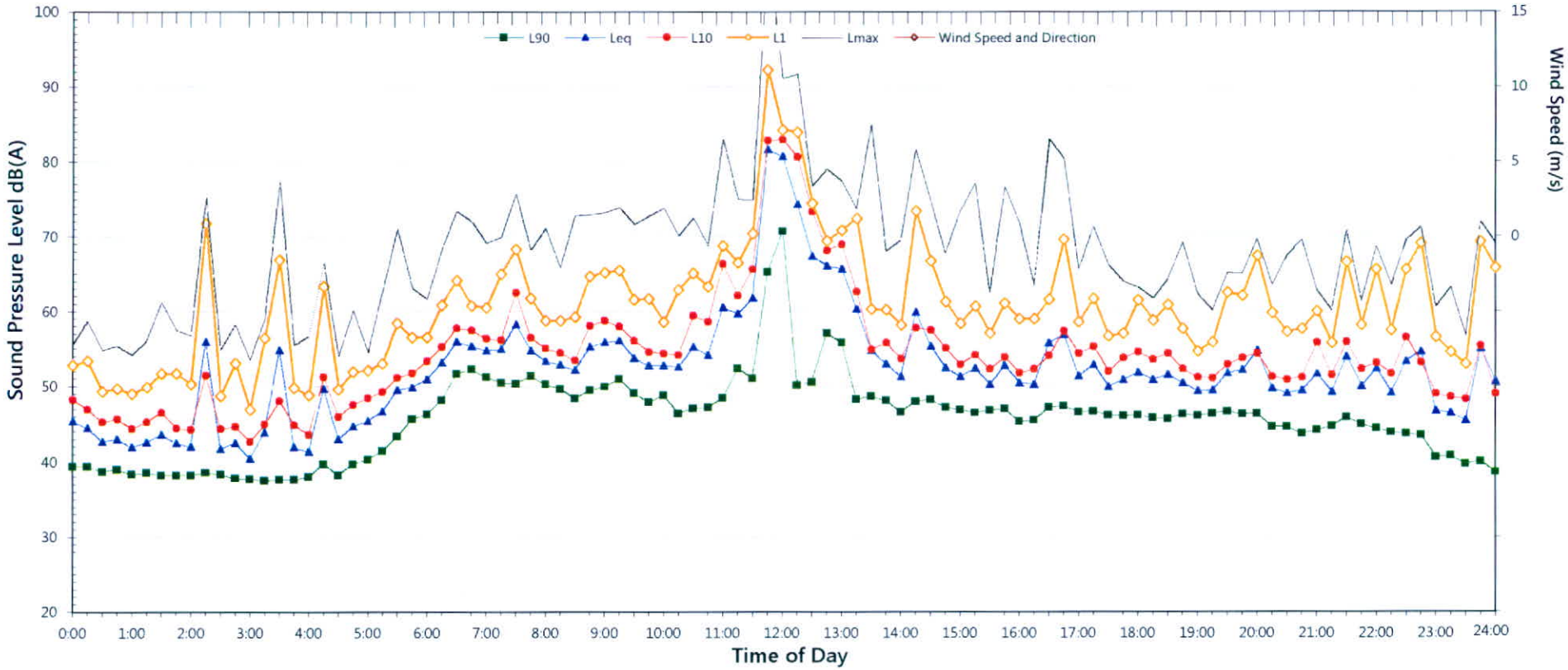
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	55.5	53.8
$L_{eq\ 1hr}$ upper 10 percentile	58.5	58.4
$L_{eq\ 1hr}$ lower 10 percentile	51.8	45.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	66.5	to	77.8
Lmax - Leq (Range)	15.6	to	27.7

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Wednesday, 21 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	46.2	44.2	36.6
Leq	68.6	51.4	49.9

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations

2. "Night" relates to period from 10pm on this graph to 7am on the following graph

3. Graphed data measured in free field; tabulated results facade corrected

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

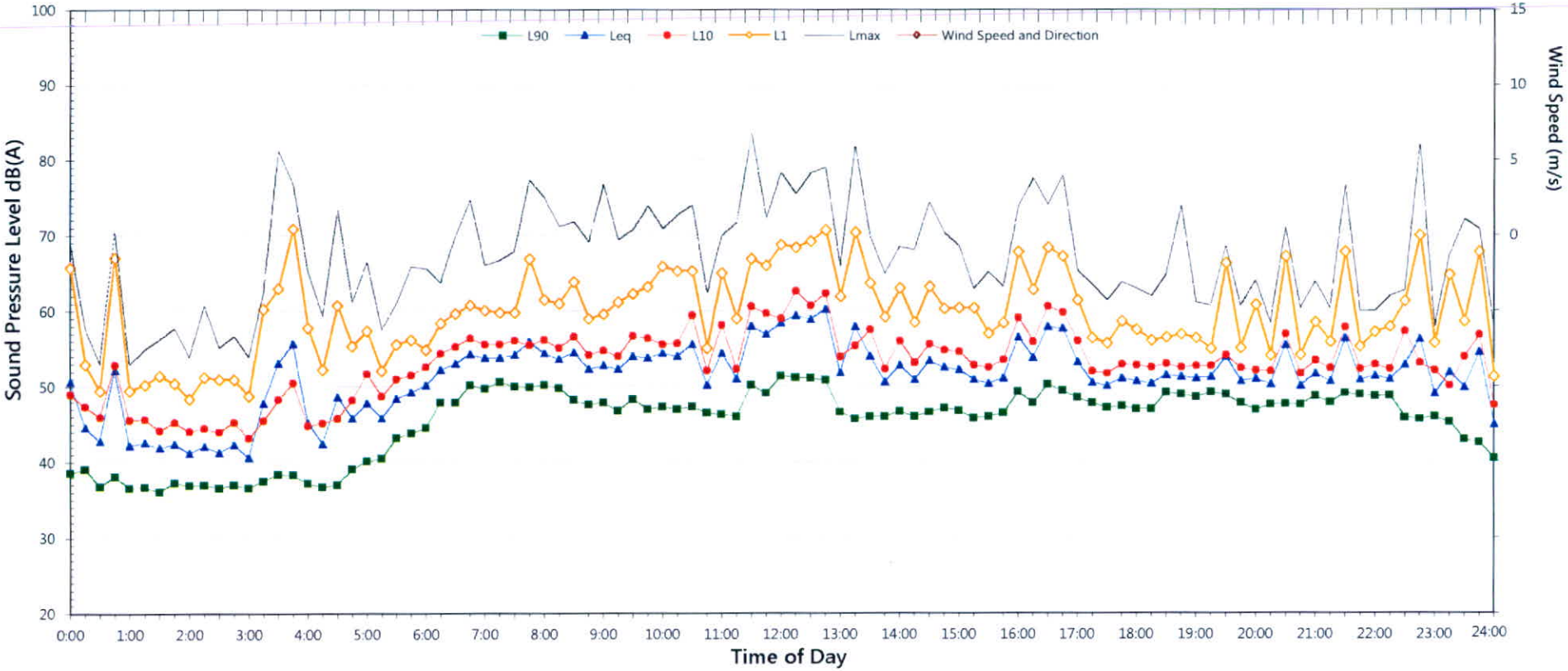
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	69.7	52.4
$L_{eq\ 1hr}$ upper 10 percentile	78.3	55.9
$L_{eq\ 1hr}$ lower 10 percentile	52.9	44.1

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	65.9	to	81.2
Lmax - Leq (Range)	15.6	to	29.0

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Thursday, 22 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	46.0	47.0	38.2
Leq	54.9	52.2	50.6

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured in free field, tabulated results facade corrected.

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

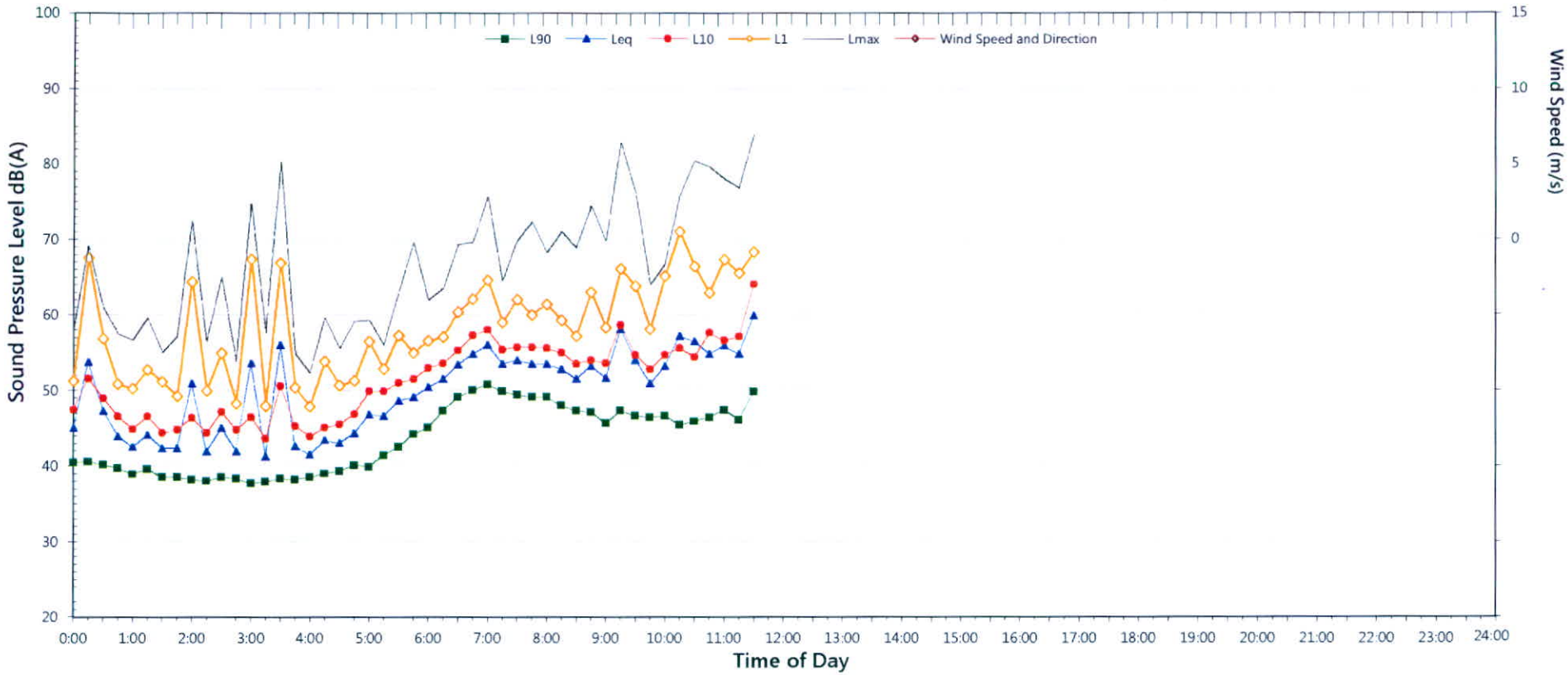
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	56.8	53.1
$L_{eq\ 1hr}$ upper 10 percentile	60.3	56.7
$L_{eq\ 1hr}$ lower 10 percentile	53.4	47.1

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	69.1	to	82.0
Lmax - Leq (Range)	19.9	to	29.9

Unattended Noise Monitoring Results

8 Epping Road, Epping - rear of site

Friday, 23 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	-	-	-
Leq	-	-	-

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise. data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph
3. Graphed data measured in free field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	57.6	-
$L_{eq\ 1hr}$ upper 10 percentile	60.6	-
$L_{eq\ 1hr}$ lower 10 percentile	54.8	-

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

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8 Epping Road, Epping - front of site facing Epping Rd

Background & Ambient Noise Monitoring Results - NSW 'Industrial Noise Policy', 2000

	L_{A90} Background Noise Levels[5]			L_{Aeq} Ambient Noise Levels		
Date	Day	Evening	Night	Day	Evening	Night
Friday-16-May-2014	-	47.2	40.2	-	65.6	62.5
Saturday-17-May-2014	50.4	47.3	37.3	66.0	65.2	62.4
Sunday-18-May-2014	48.8	46.4	36.1	65.7	64.9	62.8
Monday-19-May-2014	49.1	48.3	33.6	67.2	66.1	63.1
Tuesday-20-May-2014	50.0	47.4	36.6	66.9	65.8	63.3
Wednesday-21-May-2014	51.4	48.2	35.1	70.5	66.3	63.5
Thursday-22-May-2014	50.2	49.3	37.4	67.3	66.0	62.8
Friday-23-May-2014	-	-	-	-	-	-
Representative Weekday	**50.1**	**48.2**	**36.6**	**68.2**	**66.0**	**63.1**
Representative Weekend	**49.6**	**46.9**	**36.7**	**65.9**	**65.0**	**62.6**
Representative Week	**50.1**	**47.4**	**36.6**	**67.6**	**65.7**	**62.9**

Road / Rail Noise Monitoring Results (at one metre from façade)

	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Date	Day	Night	Day - Up	Day - Low	Night - Up	Night - Low
Friday-16-May-2014	69.0	65.0	70.4	67.2	67.6	60.9
Saturday-17-May-2014	68.3	64.9	69.4	66.9	67.3	60.6
Sunday-18-May-2014	68.0	65.3	68.9	66.6	70.7	58.1
Monday-19-May-2014	69.4	65.6	70.7	68.1	71.0	59.2
Tuesday-20-May-2014	69.2	65.8	70.3	68.1	71.5	58.3
Wednesday-21-May-2014	72.2	66.0	76.9	68.6	71.1	59.3
Thursday-22-May-2014	69.5	65.3	70.8	67.9	71.0	58.3
Friday-23-May-2014	70.1	-	71.1	69.3	-	-
Representative Weekday	**70.1**	**65.6**	**72.5**	**68.2**	**70.6**	**59.3**
Representative Weekend	**68.1**	**65.1**	**69.1**	**66.8**	**69.3**	**59.5**
Representative Week	**69.6**	**65.4**	**71.9**	**67.9**	**70.3**	**59.4**

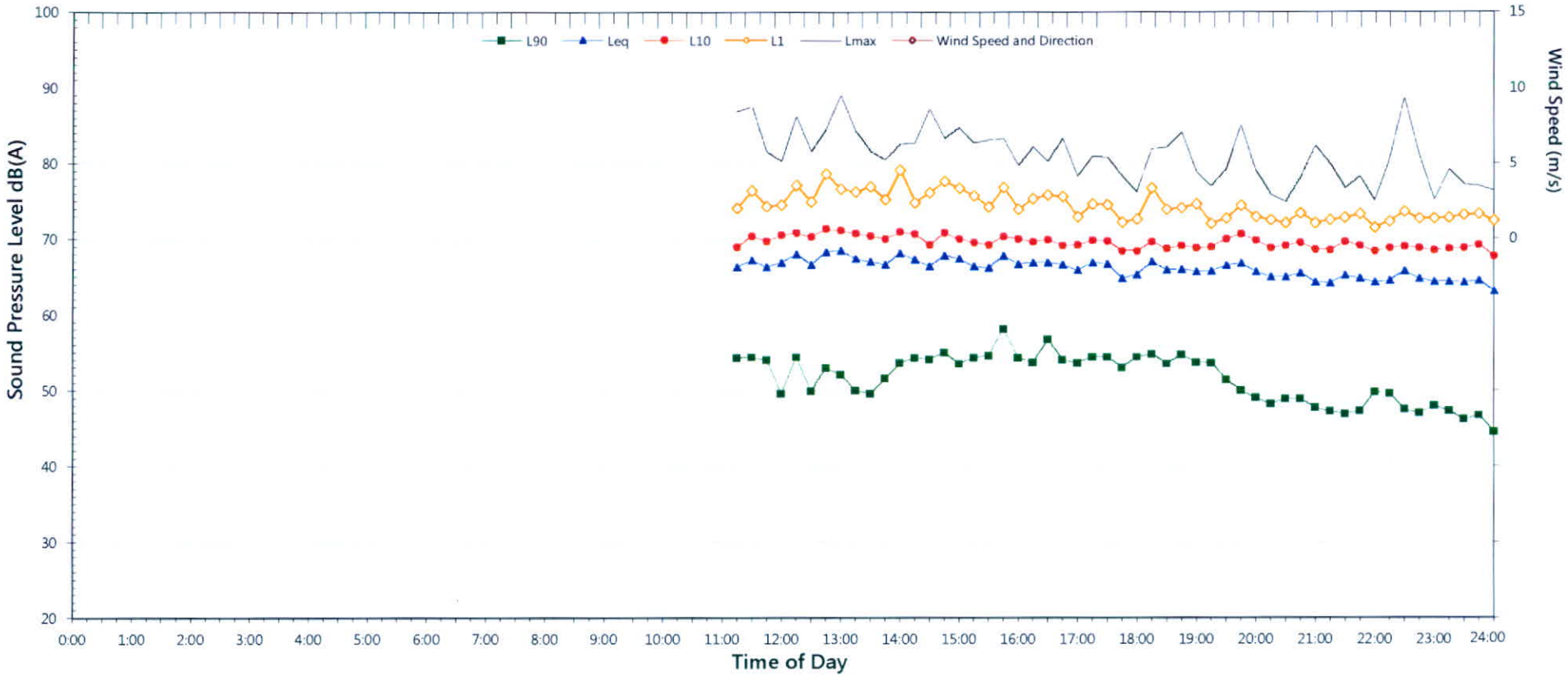
Notes:

1. Day is taken to be 7.00am to 6.00pm
2. Evening is taken to be 6.00pm to 10.00pm.
3. Night is taken to be the remaining periods
4. Rating Background Level (RBL) for L90 and logarithmic average for Leq
5. Assessment Background Level (ABL)
6. Rating Background Level (RBL) for L90 and logarithmic average for Leq

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Friday, 16 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	-	47.2	40.2
Leq	-	65.6	62.5

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise. data in these periods are excluded from calculations
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

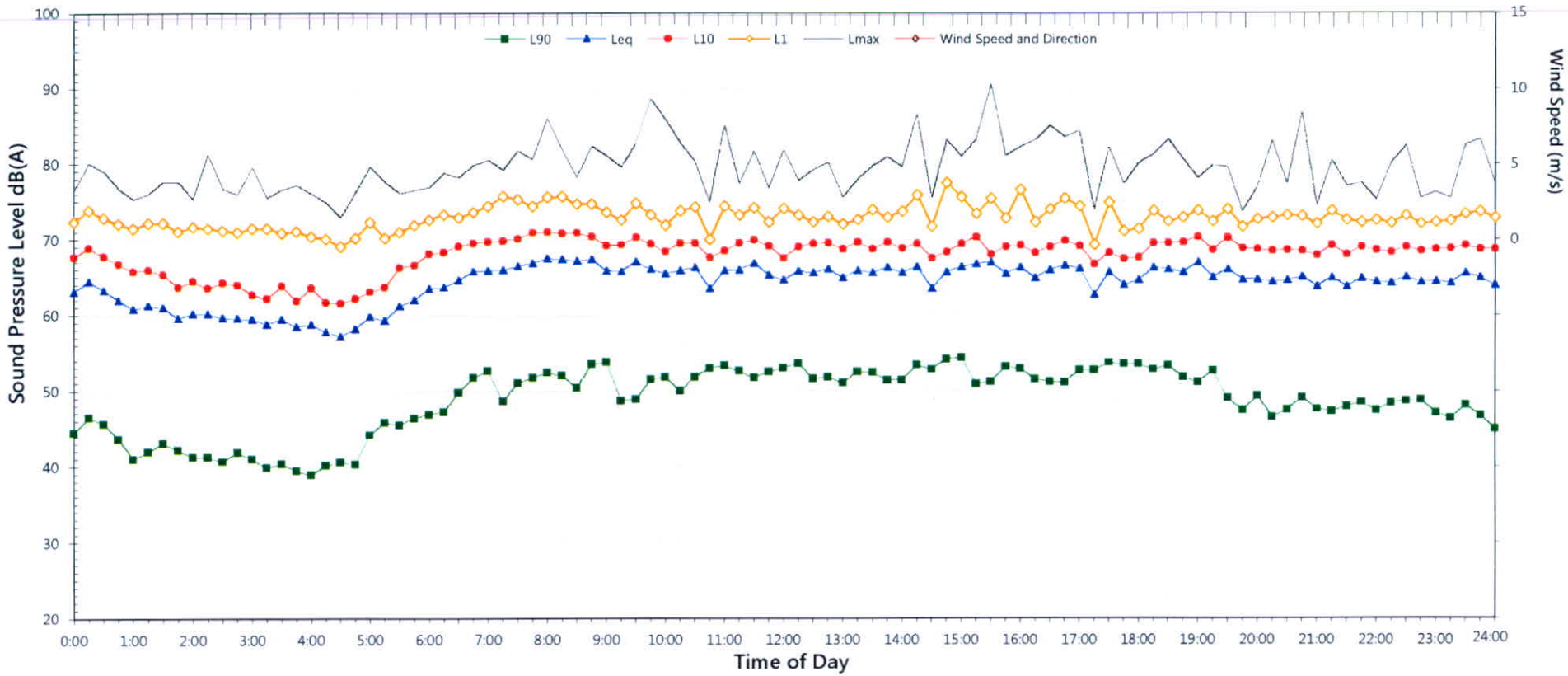
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	69.0	65.0
$L_{eq\ 1hr}$ upper 10 percentile	70.4	67.6
$L_{eq\ 1hr}$ lower 10 percentile	67.2	60.9

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.2	to	88.6
Lmax - Leq (Range)	15.1	to	23.7

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Saturday, 17 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	50.4	47.3	37.3
Leq	66.0	65.2	62.4

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations
2. "Night" relates to period from 10pm on this graph to 7am on the following graph
3. Graphed data measured in free field, tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

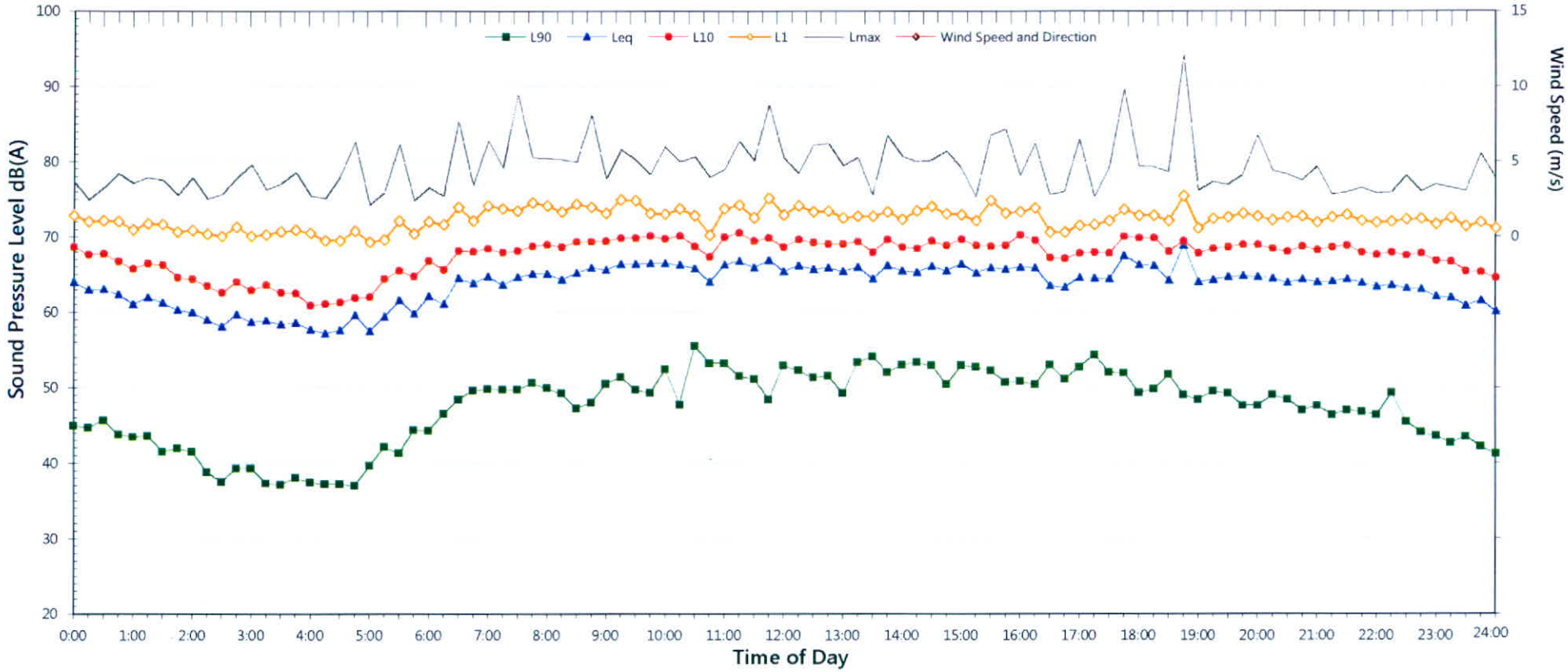
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	68.3	64.9
$L_{eq\ 1hr}$ upper 10 percentile	69.4	67.3
$L_{eq\ 1hr}$ lower 10 percentile	66.9	60.6

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.9	to	85.3
Lmax - Leq (Range)	15.9	to	24.5

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Sunday, 18 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	48.8	46.4	36.1
Leq	65.7	64.9	62.8

NOTES:

1 Shaded periods denote measurements adversely affected by rain, wind or extraneous noise. data in these periods are excluded from calculations.

2 "Night" relates to period from 10pm on this graph to 7am on the following graph.

3 Graphed data measured in free field; tabulated results facade corrected.

4 Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

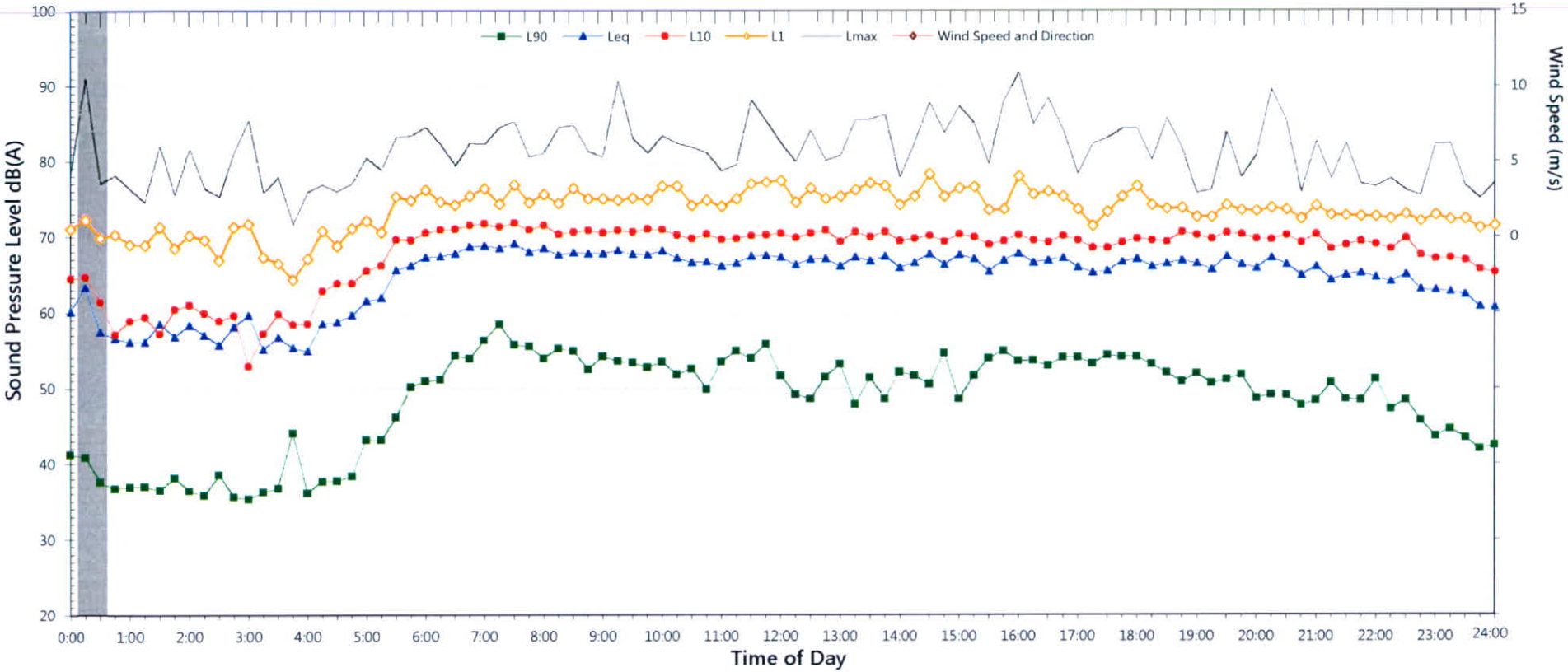
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	68.0	65.3
$L_{eq\ 1hr}$ upper 10 percentile	68.9	70.7
$L_{eq\ 1hr}$ lower 10 percentile	66.6	58.1

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.9	to	85.4
Lmax - Leq (Range)	15.1	to	27.6

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Monday, 19 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	49.1	48.3	33.6
Leq	67.2	66.1	63.1

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free field, tabulated results facade corrected.
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

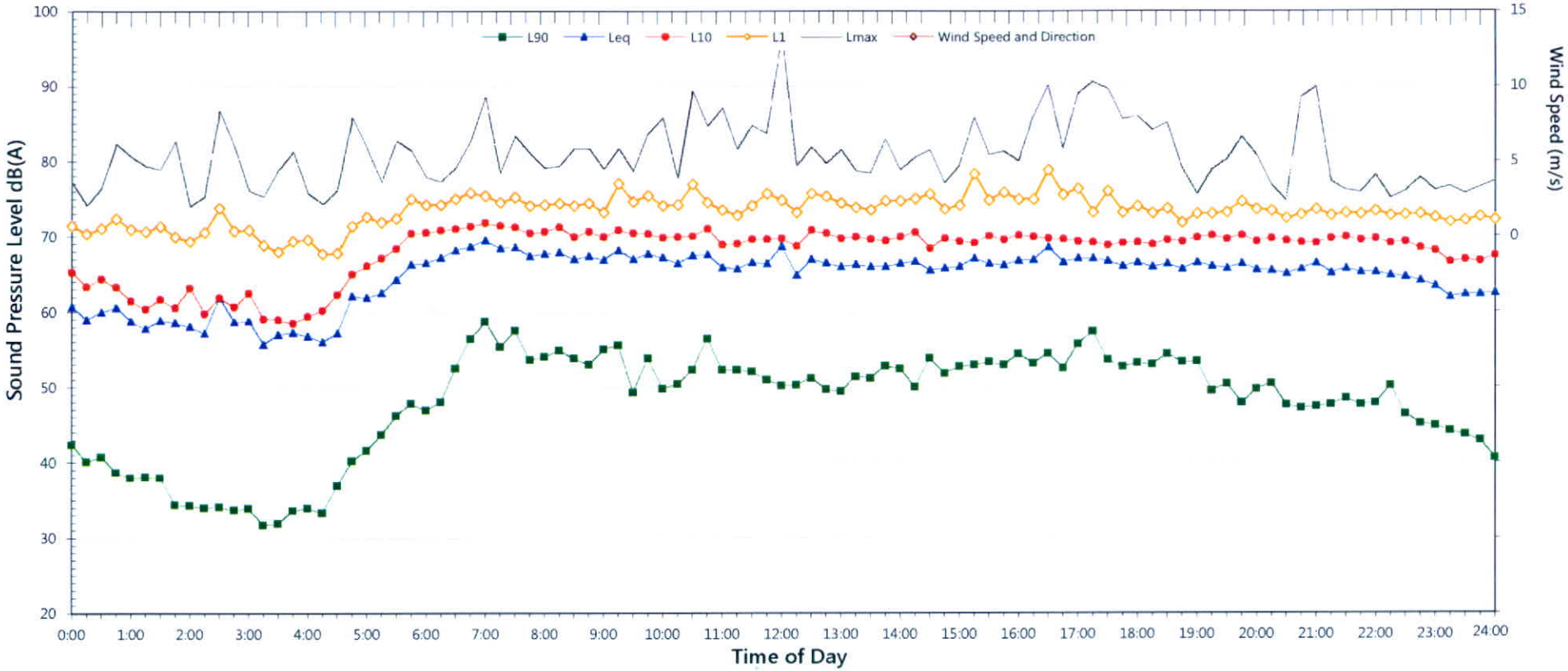
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	69.4	65.6
$L_{eq\ 1hr}$ upper 10 percentile	70.7	71.0
$L_{eq\ 1hr}$ lower 10 percentile	68.1	59.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	81.3	to	88.5
Lmax - Leq (Range)	17.5	to	27.2

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Tuesday, 20 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	50.0	47.4	36.6
Leq	66.9	65.8	63.3

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations
2. "Night" relates to period from 10pm on this graph to 7am on the following graph
3. Graphed data measured in free field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

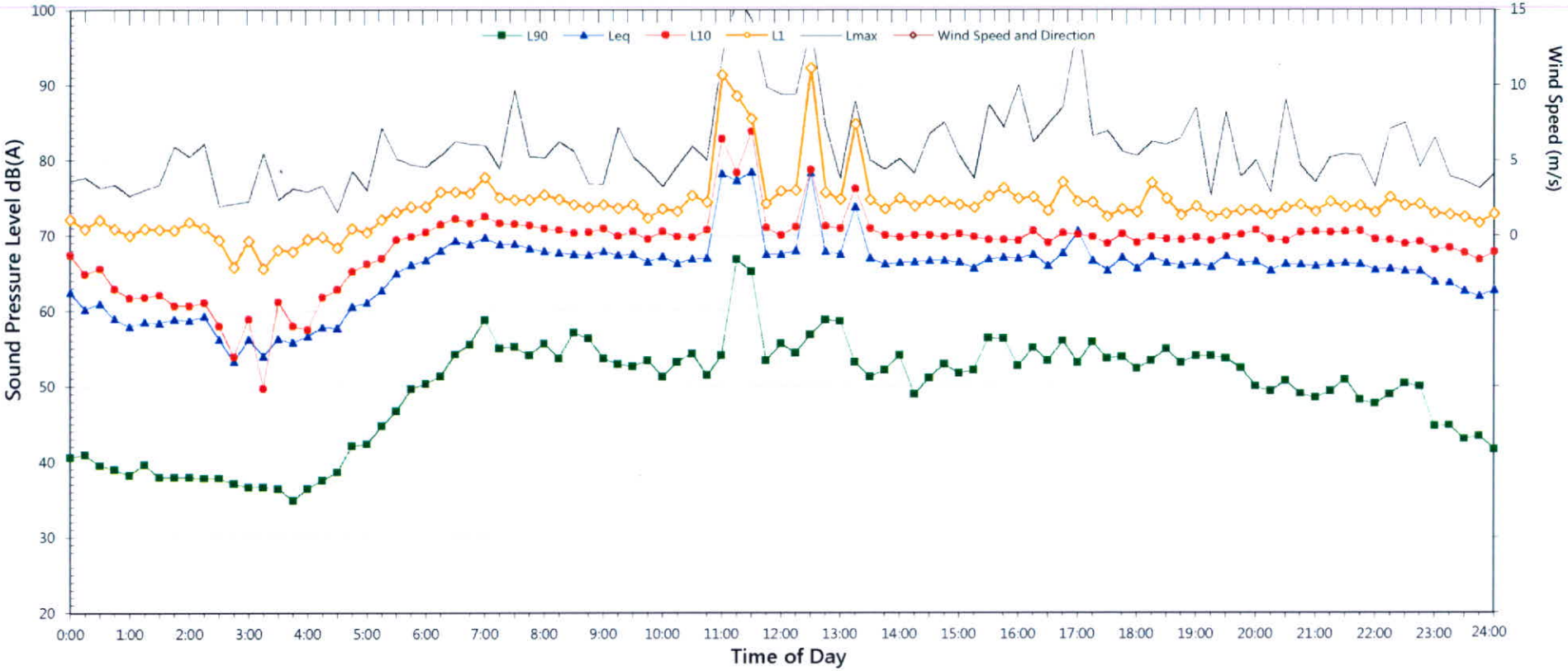
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	69.2	65.8
$L_{eq\ 1hr}$ upper 10 percentile	70.3	71.5
$L_{eq\ 1hr}$ lower 10 percentile	68.1	58.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.7	to	84.2
Lmax - Leq (Range)	18.0	to	25.4

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Wednesday, 21 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	51.4	48.2	35.1
Leq	70.5	66.3	63.5

NOTES

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations

2. "Night" relates to period from 10pm on this graph to 7am on the following graph

3. Graphed data measured in free field, tabulated results facade corrected

4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A)

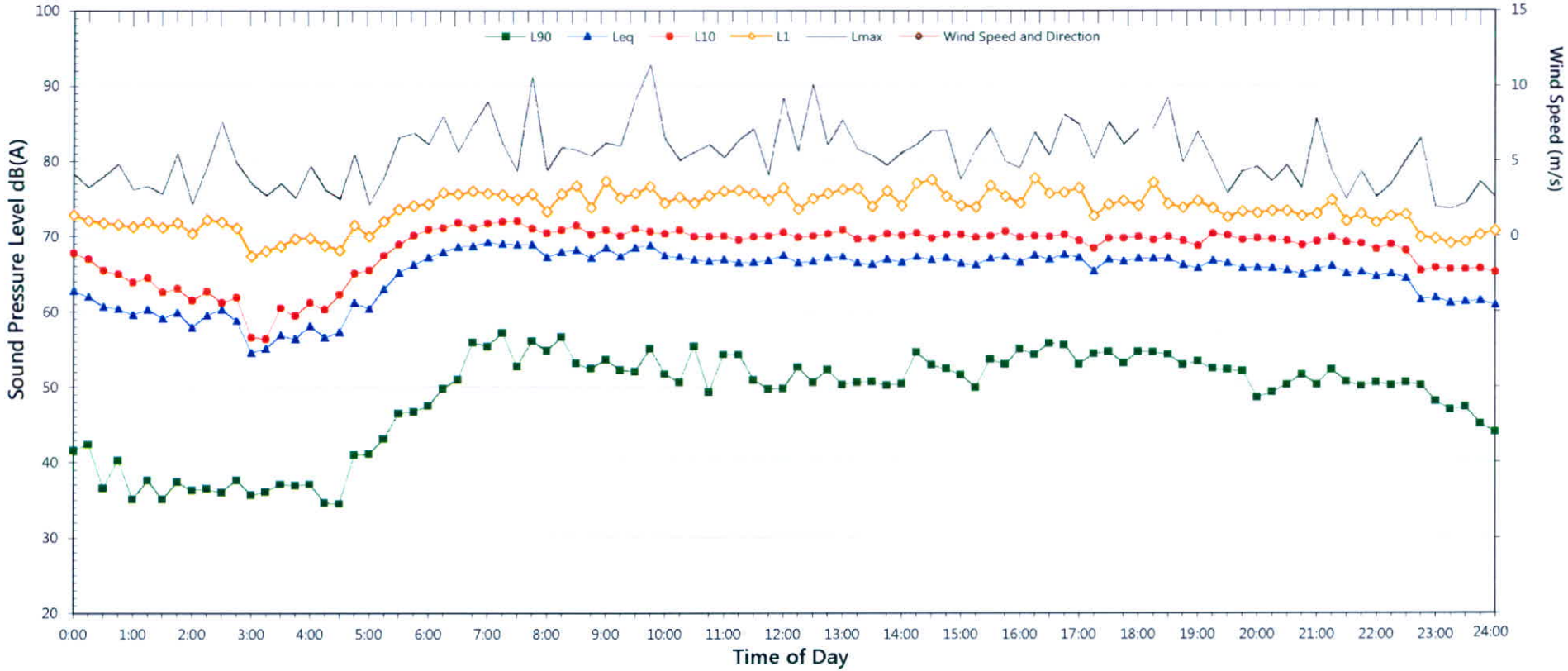
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	72.2	66.0
$L_{eq\ 1hr}$ upper 10 percentile	76.9	71.1
$L_{eq\ 1hr}$ lower 10 percentile	68.6	59.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	78.3	to	87.9
Lmax - Leq (Range)	15.4	to	26.4

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Thursday, 22 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	50.2	49.3	37.4
Leq	67.3	66.0	62.8

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise. data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free field; tabulated results facade corrected.
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

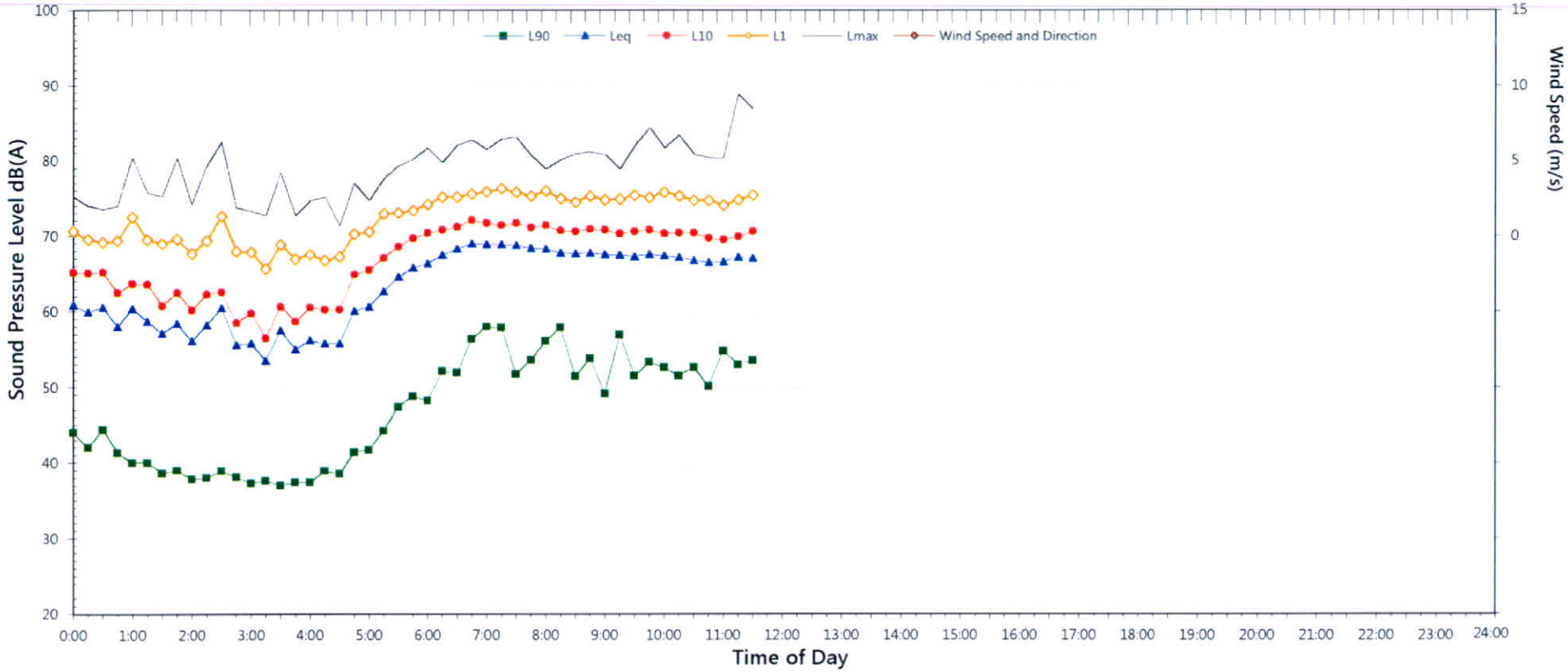
NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	69.5	65.3
$L_{eq\ 1hr}$ upper 10 percentile	70.8	71.0
$L_{eq\ 1hr}$ lower 10 percentile	67.9	58.3

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.0	to	83.0
Lmax - Leq (Range)	15.9	to	24.5

Unattended Noise Monitoring Results

8 Epping Road, Epping - front of site facing Epping Rd

Friday, 23 May 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night[2]
	7am-6pm	6pm-10pm	10pm-7am
L_{90}	-	-	-
Leq	-	-	-

NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free field; tabulated results facade corrected.
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax - Leq ≥15dB(A).

NSW Road Noise Policy (1m from facade)		(see note 3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	70.1	-
$L_{eq\ 1hr}$ upper 10 percentile	71.1	-
$L_{eq\ 1hr}$ lower 10 percentile	69.3	-

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-